

CLAIMS

- 1 1. A method for performing an input/output operation to a storage device from a
2 computer, the storage device having one or more data paths to the computer, the method
3 comprising the steps of:
4 selecting a first data path from a set of data paths to the storage device;
5 attempting the input/output operation using the selected first data path;
6 selecting, in response to an error in the input/output operation using the first data
7 path, a next data path from the linked list of data paths; and
8 attempting the input/output operation using the selected next data path.
- 1 2. The method of claim 1 wherein the set of data paths is dynamically generated in
2 response to storage device events.
- 1 3. The method of claim 2 wherein the storage device event further comprises a Fibre
2 Channel loop initialization event.
- 1 4. The method of claim 1 wherein the first data path further comprises a last used
2 data path associated with the storage device.
- 1 5. The method of claim 1 wherein the storage device further comprises a disk drive.
- 1 6. The method of claim 5 wherein the disk drive is operatively interconnected with
2 the computer by a Fibre Channel Arbitrated Loop.
- 1 7. The method of claim 1 wherein the computer further comprises a file server.
- 1 8. The method of claim 1 wherein the set of data paths are described by a related set
2 of data structures.
- 1 9. The method of claim 1 wherein the data paths utilize a Fibre Channel connection.

1 10. A method for maintaining a set of data paths accessible by a set of upper level
2 services of a storage operating system of a computer, the method comprising the steps of:
3 creating a device instance associated with a storage device;
4 creating a first path instance associated with a first path to the storage device;
5 creating, in response to events identifying an addition of a path, an additional path
6 instance associated with an additional path to the storage device; and
7 deleting, in response to events identifying a removal of a path, a path instance as-
8 sociated with the removed path.

1 11. The method of claim 10 wherein the step of creating a device instance occurs in
2 response to receipt of an event identifying an addition of a storage device.

1 12. The method of claim 10 wherein the events identifying an addition of a path is a
2 Fibre Channel loop initialization event.

1 13. The method of claim 10 wherein the events identifying removal of a path is a Fi-
2 bre Channel loop initialization event.

1 14. The method of claim 10 wherein the step of creating an additional path instance
2 further comprises the step of linking the additional path instance to a linked list of path
3 instances associated with the storage device.

1 15. The method of claim 10 wherein the device instance and path instances are acces-
2 sible via an application program interface.

1 16. The method of claim 10 wherein the set of upper level services further comprises
2 a redundant array of inexpensive disks layer of the storage operating system.

1 17. A computer for use with a plurality of storage devices having one or more data
2 paths associated with the storage devices, the computer comprising:
3 means for detecting changes to the data paths associated with the storage devices;

means for maintaining a set of path instances associated with each of the plurality of storage devices, the data path instances accessible to a set of upper level services;

means for performing input/output operations to the plurality of storage devices using a first data path;

means for selecting alternate data paths, in response to an error occurring with the first data path; and

means for performing input/output operations to the plurality of storage devices using the selected alternate data paths.

18. The computer of claim 17 wherein the upper level services access the data path instances via an application program interface.

19. A storage operating system executing on a computer, the storage operating system comprising:

a routing administration layer, the routing administration layer dynamically updating a set of device instances, each device instance associated with a storage device;

wherein each device instance includes at least one path instance, each path instance identifying a path from the computer to the associated storage device; and

a set of upper level services, the upper level services capable of accessing the device instances.

20. The storage operating system of claim 19 wherein the routing administration layer further comprises an application program interface, the application program interface providing the upper level services access to the set of device instances.

21. The storage operating system of claim 19 wherein the upper level services further comprises a redundant array of independent disks layer of the storage operating system.

22. A computer-readable medium, including program instructions executing on a computer, for performing an input/output operation to a storage device having one or more data paths to the computer, the program instructions including steps for:

4 selecting a first data path from a linked list of data paths to the storage device;
5 attempting the input/output operation using the selected first data path;
6 selecting, in response to an error in the input/output operation using the first data
7 path, a next data path from the linked list of data paths; and
8 attempting the input/output operation using the selected next data path.

1 23. A computer-readable medium, including program instructions executing on a
2 computer, for maintaining a set of data paths accessible by a set of upper level services of
3 a storage operating system, the program instructions including steps for:
4 creating a device instance associated with a storage device;
5 creating a first path instance associated with a first path to the storage device;
6 creating, in response to events identifying an addition of a path, an additional path
7 instance associated with additional path to the storage device; and
8 deleting, in response to events identifying a removal of a path, a path instance associated
9 with the removed path.